

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 928 917 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.07.1999 Bulletin 1999/28

(51) Int. Cl. 6: F16K 7/17, F16K 7/12

(21) Application number: 98100285.0

(22) Date of filing: 09.01.1998

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant:
Raphael Valves Industries (1997) Ltd.
Or Akiva (IL)

(72) Inventor: Frenkel, Boris
42320 Israel (IL)

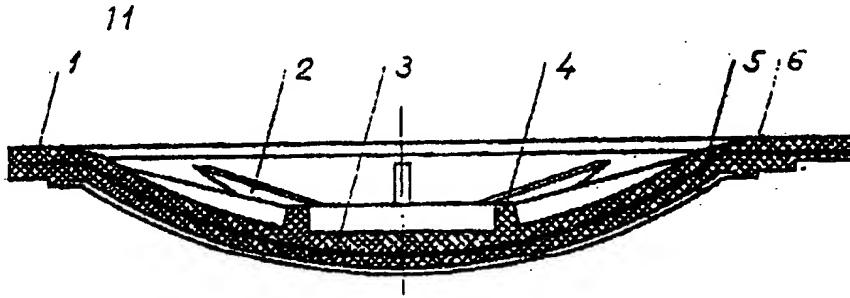
(74) Representative:
Modiano, Guido, Dr.-Ing. et al
Modiano, Josif, Pisanty & Staub,
Baaderstrasse 3
80469 München (DE)

(54) Diaphragm for valves

(57) A diaphragm (1) for use in diaphragm valves, wherein the diaphragm is constituted by a dished, circular disc of elastic material which on its surface, which is opposite the surface of contact with the valve seat in

closing position, has a number of ribs (2) forming a spider design, at least one circular ridge (3) being provided at the centre of the diaphragm intersecting all said ribs.

Fig. 2



Description**Field of Invention**

[0001] The invention relates to hydraulic valves, and more particularly to diaphragm valves. The subject matter of this application being an improved diaphragm, such valves are widely used in water supplying systems, pipe lines conveying oil/gas and any other liquids. The generally known types of such valves usually comprise a dished, elastic diaphragm constituted by an elastic, dished circular disc some part of which has cylindrical, conical or spherical form.

[0002] The diaphragm in such valves is moved to an end position either forcefully (piston-cylinder), or by pressure effect, or by specially installed spring. When pressure is terminated, the diaphragm returns to an initial position by spring. The use of spring and auxiliary parts providing stability of spring action is disadvantage of this structure.

[0003] There are various types of diaphragm which differ by design, shape and size, but, in general, principle of their structure and action is the same as those described above. U.S. Patent 2302930 relates to a valve diaphragm however of different construction.

[0004] The diaphragm returns to lower position when no pressure is over it, by a spring inserted within hermetically sealed space formed between cover and the diaphragm. If this spring were not inserted, the upper position of the diaphragm (a state when no pressure is over it) would be unstable. Namely, return of the diaphragm to lower position cannot be guaranteed.

Object of the Invention

[0005] It is the main object of the present invention to provide a novel diaphragm which would return to its initial position without the use of a spring.

[0006] The above task is achieved by means of the construction of the diaphragm which comprises:

a dished, circular disc of elastic material which on its surface, which is opposite the surface of contact with the valve seat in closing position, has a number of ribs forming a spider design, at least one circular ridge being provided at the centre of the diaphragm intersecting all said ribs.

Short Description of Drawings

[0007] The invention will now be described in detail having reference to the accompanying drawings which exemplify an embodiment of the new diaphragm.

In the drawings Figure 1 illustrates the state of art, as hitherto known.

Fig. 2 shows the new diaphragm in a sectional view

in closing position,

Fig. 3 is a top, plan view of the diaphragm.

Fig. 4 illustrates the opposite side of the diaphragm.

Fig. 5 is a cross section of Figure 4.

Detailed Description of Preferred Embodiment

[0008] Turning first to Figure 1, the conventional chest 10 is interposed between the ends of consecutive sections 11, 12 of a pipe line - within the chest 10 is located the diaphragm 1 depicted by a fat line indicating its closing position on the seat 13. The open position of the diaphragm is shown in a broken line 1'. A spatial helix spring 14 initiates and/or assists the movement of diaphragm 1 from open to closing position.

[0009] Turning to Fig. 2 the new diaphragm indicated as a whole by reference numeral 1 is composed of two layers 5 and 6 of elastic material forming together a dished, circular body.

[0010] On the upper, (non-closing) surface of the diaphragm 1 are provided a number (in the example shown eight) diametrically extending ribs 2 which form a spider like design (see Fig. 2). In the centre of the dished diaphragm 1 is located a circular ring shaped ridge 3 which intersects all ribs 2.

[0011] As can be seen in Fig. 4 on the opposite side of diaphragm 1 there are provided longitudinal protrusions 7 (ribs) at both sides of sealing rib 8 and parallel thereto, said protrusions are noise dampers and reduce vibration.

[0012] In practice the diaphragm which shuts off the passage of water (or other liquid) through the valve is put into closing position in the conventional way, either manually using generally known arrangements, or automatically also generally known and practiced. In order to reverse the closing position of the diaphragm into the open position indicated by broken lines in Fig. 1 no initiating or assisting actions by a spring, as hitherto employed, is required. Whenever the action of factors, such as cessation of pressure of the flow of liquid through the valves ceases, the position of the diaphragm from the closing position shown in full lines in Fig. 1 to that depicted by a broken line is automatically effected due to the combined tendency of ribs 2 and ridge 3 (or ridges 3, if more than one) to revert to the "open" position indicated by the broken line.

[0013] Spring characteristics of the diaphragm depend upon the number and size of radial and circular ribs. Enlarged force developed by the diaphragm may be provided by increased number and size (height, width, length) of ribs.

[0014] Noise suppression by ribs 7 is achieved as follows:

When the flow rate of liquid passing through the cock is regulated, the gap between sealing rib 8 and seat 13 of the cock may be reduced to the range from 0.5-1.5mm. The flow rate increases considerably in this insignificant gap which results in a strong unpleasant noise during cock operation.

5

[0015] Unlike long-standing diaphragm cock, ribs 7 that are positioned in front and behind said gap form an eddy flow in this zone which suppresses noise during cock operation.

10

[0016] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

15

Claims

20

1. Diaphragm for use in diaphragm valves, this being constituted by a dished, circular disc of elastic material which on its surface, which is opposite the surface of contact with the valve seat in closing position, has a number of ribs forming a spider design, at least one circular ridge being provided at the centre of the diaphragm intersecting all said ribs.
2. The diaphragm claimed in claim 1, characterized thereby that it has a multiple number of concentric circular ridge on one of its surfaces.
3. The diaphragm claimed in claim 1 characterized thereby that a plurality of longitudinal ribs are provided parallel to the sealing rib.
4. Diaphragm valves containing diaphragms according to foregoing claims.

25

30

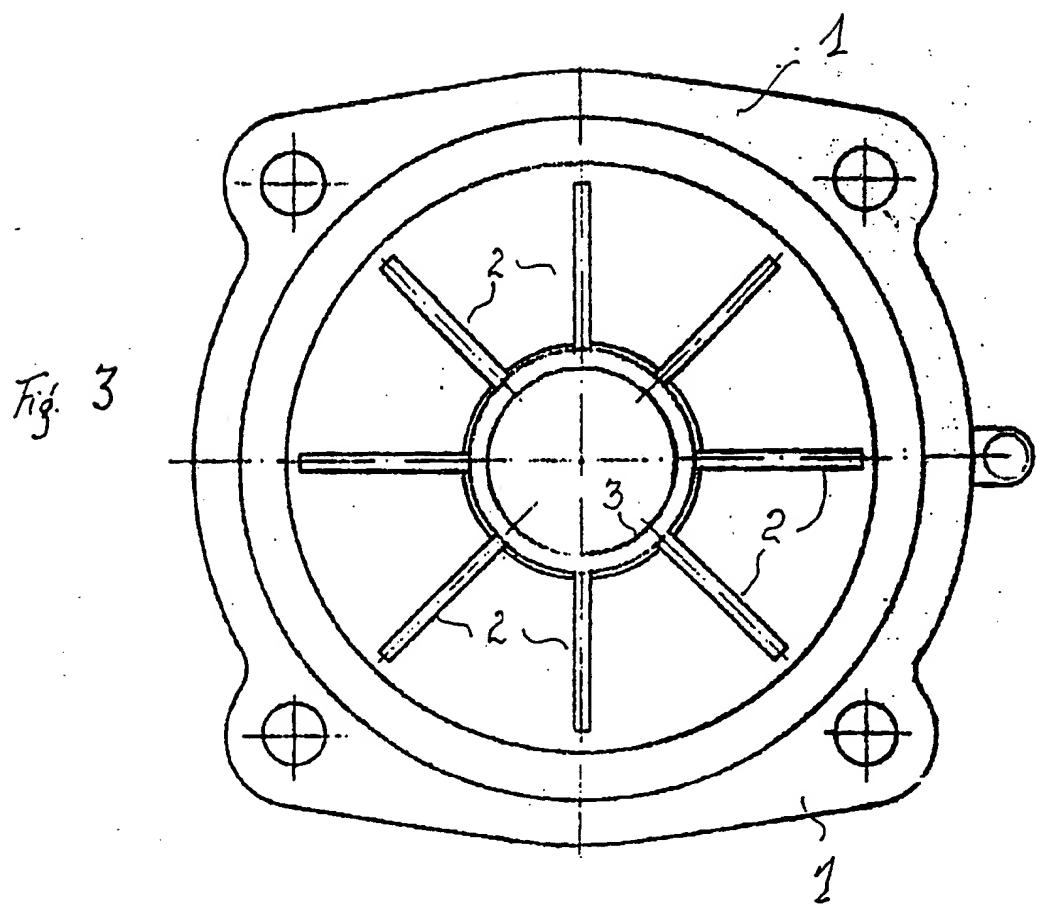
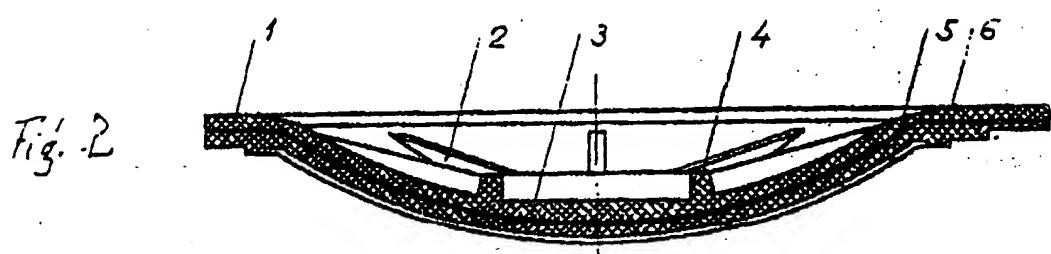
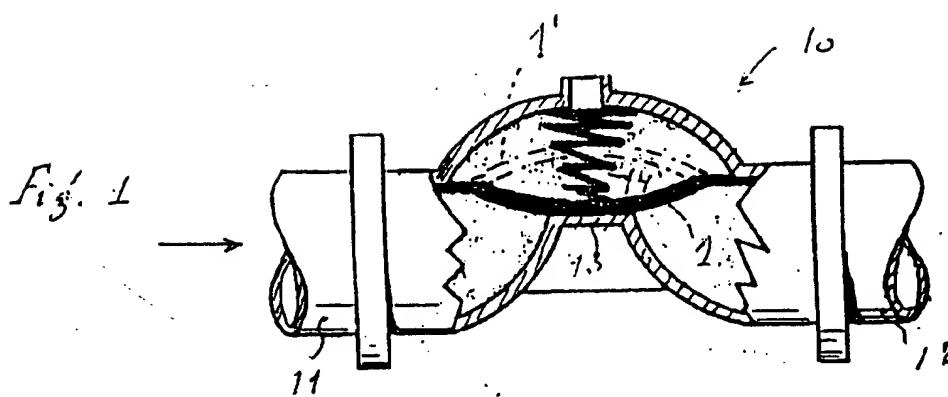
35

40

45

50

55



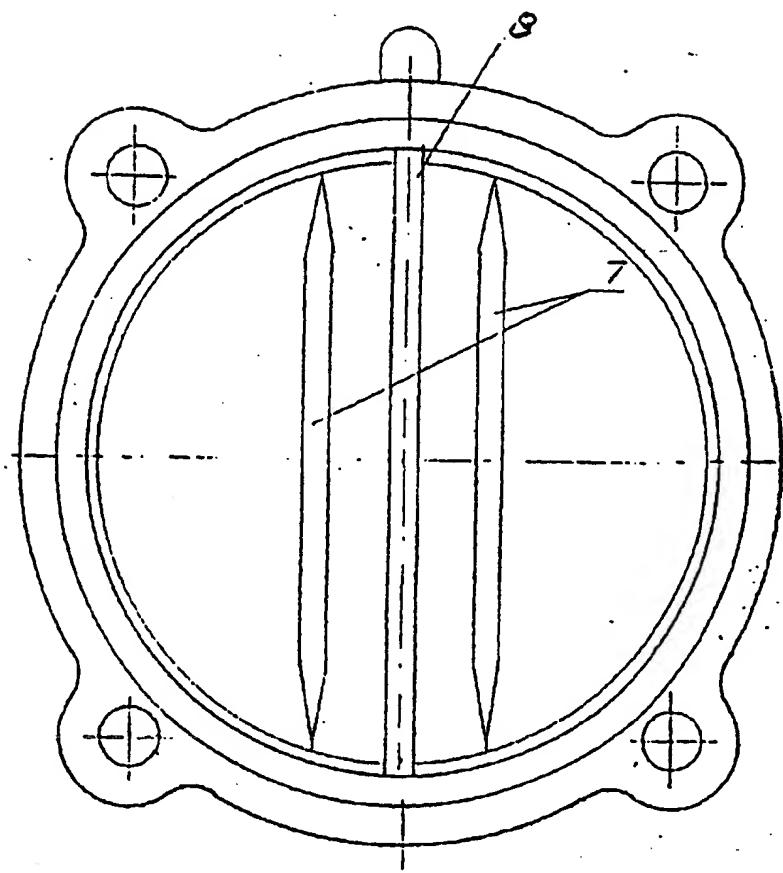


FIG. 4

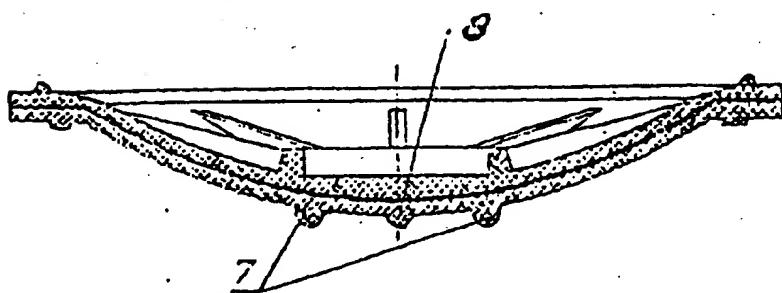


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 0285

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | CLASSIFICATION OF THE APPLICATION (Int.Cl.) |
|--|--|-------------------|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.) |
| A | US 3 779 274 A (KELLY S) * column 3, line 57 - line 65; figure 3 * | 1-4 | F16K7/17 F16K7/12 |
| A | US 5 349 896 A (DELANEY III WILLIAM E ET AL) * abstract; figures 4,5 * | 1 | |
| A | FR 1 313 975 A (COURTAUD) * page 2, left-hand column, line 20 - line 25; figure 2 * | 1,2 | |
| A | US 5 335 584 A (BAIRD DAYNE E) * column 5, line 51 - line 61; figure 9 * | 1 | |
| A | US 3 083 943 A (STEWARD) * figures 1,2 * | 1,4 | |
| D,A | US 2 302 930 A (ANDERSON) | | |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.) |
| | | | F16K F16J |
| The present search report has been drawn up for all claims | | | |
| Place of search | Date of completion of the search | Examiner | |
| BERLIN | 8 May 1998 | Schlabbach, M | |
| CATEGORY OF CITED DOCUMENTS | | | |
| X : particularly relevant if taken alone | T : theory or principle underlying the invention | | |
| Y : particularly relevant if combined with another document of the same category | E : earlier patent document, but published on, or after the filing date | | |
| A : technological background | D : document cited in the application | | |
| O : non-written disclosure | L : document cited for other reasons | | |
| P : intermediate document | & : member of the same patent family, corresponding document | | |